SEMESTER EXAMINATION, DECEMBER, 2025

Course Name: - B. Tech. **Semester:- III**

Paper Name: - Engineering Mathematics **Paper Code:- NBS-302**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **3 mark. All questions are compulsory**.
- Section B- Answer any **5 out of 7** given questions. Each question carries **7 marks**.
- Section C- Answer any **2 out of 3** given questions. Each question carries **10 marks**.

Section – A (खण्ड–अ)

Multiple Choice Questions (बहुविकल्पीय प्रश्न)

1. Answer all the following questions. **5x3 =15**

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) Which of the following series converges?

(a) $\sum_{n=1}^{\infty} \frac{1}{n}$

(b) $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$

(c) $\sum_{n=1}^{\infty} \frac{1}{n^2}$

(d) $\sum_{n=1}^{\infty} \frac{n}{n+1}$

ii) If a function f(z)=u+iv is analytic in a domain R then

(a) $u_y = v_x, u_x = v_y$

(b) $u_x = v_y, u_y = -v_x$

(c) a and b both

(d) none of these

iii) The radius of convergence of the power series: $f(z) = \sum_{n=0}^{n=\infty} \frac{n!}{n^n} z^n$ is

(a) 1

(b) $1/e$

(c) e

(d) e^2

iv) Rate of convergence of Newton Raphason method is

(a) 1

(b) 1.5

(c) 0.5

(d) 2

v) Which rule is exact for integrating polynomials up to the third degree?

(a) Trapezoidal Rule

(b) Simpson's 1/3 Rule

(c) Midpoint Rule

(d) Simpson's 3/8 Rule

Section - B (खण्ड–ब)

Short Answer Questions (लघूउत्तरीय प्रश्न)

2. Answer any five of the following questions. **5x7=35**

निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर दें।

i. (a) Write the necessary condition for convergence of a series. Test the convergence of the series $1+\frac{2}{3}+\frac{3}{4}+\cdots\cdots\frac{n}{n+1}+\cdots\infty$

(b) Define Analytic function, orthogonal function, Harmonic and conjugate harmonic function.

ii. Define Limit, continuity and Differentiability. Consider the function $f(x)=4x+y+i(-x+4y)$ and discuss df/dz.

iii. Show the function $f(z)=\begin{cases}\frac{x^3(1+i)-y^3(1-i)}{x^2+y^2} & ,z\neq 0,\\ 0 & ,z=0\end{cases}$ satisfy C-R equations at z=0 but not analytic at z = 0.

iv. (a) Find the residue of a function $f(z)=\frac{z^2}{(z+1)^2(z-2)}$ at its poles.

(b) Find the singularity of the function f(z)= sin (1/z) and $g(z)=e^{1/z}/z^2$.

v. Using Bisection method obtain the smallest positive root of the equation $f(x)=x^3-5x+1=0$.

vi. Prove the followings

(a) $\mu^2=1+\frac{1}{4}\delta^2$

(b) $E^{\frac{1}{2}}=\mu+\frac{1}{2}\delta$

vii.

(a) If $u_0=1,u_1=0,u_2=5,u_3=22,u_4=57$ find $u_{0.5}$

(b) Given

X	1	2	3	4	5	6	7	8
f(x)	1	8	27	64	125	216	343	512

Estimate f(7.5).

Section - C

Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question. **2x10=20**

निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर दें।

i)

(a) Expand f(z) = cosh (z+1/z).

(b) If $u-v=(x-y)(x^2+4xy+y^2)$ and $f(z)=u+iv$ Find $f(z)$.

ii)

(a) Find the smallest positive root of the equation $x^3-2x+0.5=0$ using Newton Raphson method.

(b) Prove that $D=\frac{1}{h}[\Delta-\frac{1}{2}\Delta^2+\frac{1}{3}\Delta^3+\cdots\ldots]$. where D=d/dx.

iii) Using Euler's method solve the differential equation in six steps: $\frac{dy}{dx}=x+y.y(0)=0,\ h=0.2$

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